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Update on Pest Management and Crop Development

FRUIT JOURNAL

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INSECTS

JUST IN FROM JOISEY?

VISITOR FROM THE EAST

(Art Agnello, Entomology, Geneva)

❖❖ The oriental fruit moth (OFM), native to China, was introduced into the United States from Japan about 1913 on infested nursery stock. The OFM is now found in all regions of North America where peaches are grown. Although it is most important as a pest of peach, the OFM has an extensive hop⁄ range that includes apple, quince, pear, plum, cherry, apricot, nectarine, and some rosaceous ornamentals. In the northeastern United States, the OFM has three generations (flights) per year. In areas with a longer growing season, it may have up to five generations per year.

On peach, the OFM feeds in both vegetative growth and fruit. The first generation, which is feeding when terminals are succulent and tender, develops almost exclusively in the vegetative growth. The larvae often enter the terminal at the base of a young leaf, and tunnel toward the base of the shoot. Infested terminals wilt and die back to the margin of feeding, and are commonly called "strikes" or "flagged shoots". Heavy twig infestations of nursery stock can adversely affect the shape of the tree. Axillary buds often begin to grow when the terminal shoot is killed, causing the tree to have a bushy appearance.

Fruit that are infested when very small often drop. Early infested peaches that do not drop have obvious entrance holes with frass and gum exuding from them. Larvae attacking nearly ripe peaches usually enter the fruit near the stem, leaving only a very small, inconspicuous entrance hole. The larvae tunnel in the fruit, and frequently excavate cavities near the pit.

Terminal feeding on apple is similar to that on peach. Infested apples have a collection of frass at the exit hole of the insect's feeding tunnel, or at the calyx end. It is difficult to distinguish between OFM damage and codling moth damage. OFM larvae feed randomly in the apple, and usually do not feed on the seeds, while codling moth larvae usually tunnel directly to the core of the apple and feed on the seeds. Later instar larvae of the two species may be distinguished by the presence or absence of the anal comb at the tip of the abdomen. The anal comb is present in the OFM and absent in the codling moth.

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More than 130 species of parasitoids have been reported attacking OFM; however, parasitism probably plays a very minor role in OFM control in today's commercial orchards because of the sensitivity of many parasitoids to commonly used insecticides. Before the advent of the organochlorines, attempts were made to supplement naturally occurring biological control of the OFM. Inundative releases of the braconid wasp, *Macrocentrus ancilivorus*, provided an average 50% reduction in number of infested fruit. However, because of the large pest complex on apple, biological control of one pest is difficult to achieve, since broad-spectrum insecticides are still needed for other pests.

Research on mating disruption of OFM has shown that if a synthetic sex pheromone is released in high concentrations during bloom, male Oriental fruit moths cannot locate a female to mate. However, this approach is economically justified in N.Y. only if 2–3 sprays are normally applied to control this pest, and if no other insecticide sprays are routinely needed after shuck split. For most commercial blocks, where 2nd brood larvae threaten fruits as they ripen, an application of carbaryl (Sevin) is recommended 2 weeks before harvest or, for those depending on scouting results, when larval numbers reach 1 per 10 terminals.

Recent complaints of ineffective control in some peach blocks having more severe pressure (particularly in far western NY) may indicate a failure to take care of the early larvae sufficiently. The recommendations from Ontario, where OFM is a more serious problem, are to spray about a week after the peak of both the first and second flights (usually near the end of shuck split and early to mid-July, respectively), possibly following up with a second application in each case. Our first flight peaked back in mid-May, and the second flight should be getting under way in a week or so. The second application against the resulting generation would correspond with the 2-week pre-harvest spray noted above for many varieties. In recent years, some tolerance or resistance tendencies have been noted in local populations, so this is a case where rotation to alternative chemical classes would be recommended; other choices would include Lorsban, Lannate, or a pyrethroid. (Adapted from Oriental Fruit Moth Fact Sheet #17, by A. J. Seaman and H. Riedl).❖❖

ROOF WORK

TAKE CARE OF YOUR CANOPY

(Art Agnello, Entomology, & Alan Lakso, Horticultural Sciences, Geneva)

❖❖ Regardless of how attentively you have watched the numbers of mites in your specific orchards up to this point, a careful examination of at least the traditional trouble spots is recommended at this time, for a number of reasons. First, we are past the period of effectiveness of early season applications of oil, and even the small percentage of survivors from the most successful pre-bloom control programs could start to increase to problematic levels by now. Also, this is normally the time when we see a big jump in numbers of motile forms because the first crop of European red mite summer eggs has completed their hatch. The hot weather we are

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experiencing has been ideal for mite growth, so even though the ERM threshold goes up to 5 per leaf in July, the mites tend to increase exponentially now, so it's no contest for all that new growth the trees have been putting on recently. Because of their early start this year, ERM could easily squeeze in an entire extra generation before the summer's out. This may not be evident just yet, but that extra flush of motile forms at the end of August will seem like the coup de grace if they weren't properly attended to when they pole-vaulted past threshold two months before.

This type of weather is also much favored by twospotted spider mites. Recall that the TSSM overwinters as an inactive adult female beneath bark scales or under debris on the orchard floor. Occasionally, when winter temperatures are warm enough, the mites remain active and maintain a low population on weed hosts or cover plants in the orchard. As summer approaches and temperatures rise, mite populations increase and they begin to move up the tree trunks to the foliage. Lower portions and canopy centers are attacked first, then the mites spread to the outside of the trees as their population increases. Feeding on pear leaves causes a unique browning or blackening of the foliage. It is not uncommon to have a colony of only 2–3 mites near the midrib of a leaf, and as a result of their feeding there is a blackening of large sections of leaf from the midrib to the margin. A low number of TSSM is more damaging than a similar count of ERM, and foliar blackening may appear after the mites have been controlled, brought about by a period of hot weather shortly after an effective spray has been applied.

It's important to note that any foliar pests could become particularly troublesome this season because of the combination of drought stress and relatively high fruit loads evident in many areas. Even though we may do everything well with our tree design and canopy management, the potential we've developed may not be realized if the leaf health is destroyed by foliar pests like mites,

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INSECT TRAP CATCHES (Number/Trap/Day)

Geneva, NY

	6/14	6/17	6/21
Spotted tentiform leafminer	211	197	153
Redbanded leafroller	0	0	0
Oriental fruit moth	0.8	2.0	1.3
Lesser appleworm	0.1	0.8	0.5
Codling moth	1.1	10.3	8.4
American plum borer	1.8	0	0
Lesser peachtree borer	2.1	1.0	1.3
Pandemis leafroller	2.3	0	0
Obliquebanded leafroller	1.5	0	0.4
Peachtree borer	0.4	0.2	1.6

Highland, NY

	6/7	6/14	6/21
Spotted tentiform leafminer	15.9*	38.5	10.3
Redbanded leafroller	0	0.1	0.9
Oriental fruit moth	0.6	0.4	0.4
Codling moth	1.1	1.0	0.5
Lesser appleworm	0.9	0.4	0.6
European red mite(#/leaf)	6.4	5.2	17.8
Two-spotted spider mite(#/leaf)	0.07	3.0	5.8
San Jose scale	0.4	0.4	0
Fruitree leafroller	0	0	0
Obliquebanded leafroller	3.8	5.1	4.8
Tufted apple budmoth	0	4.0*	3.7
Variegated leafroller	0	2.3*	0.7
Sparganothhis fruitworm	0	2.1*	1.9
Apple maggot	–	–	0

Hudson, NY

	6/7	6/14	6/21
Spotted tentiform leafminer	0.2	8.5	7.6
Oriental fruit moth	1.5	2.1	1.3
San Jose scale	–	0	–
American plum borer(cherry)	1.9	1.5	1.3
Lesser peachtree borer(peach)	1.4	0.8	6.3
Peachtree borer	0.9	0.9	3.2
Tarnished plant bug	0	0	0.2*

* first catch

leafminers or leafhoppers. Research has shown that foliar pests like mites, leafminers and leafhoppers reduce the leaf's ability to make sugars by photosynthesis. We feel that reducing the carbohydrates available to the fruit is probably the mechanism by which foliar pests affect apple trees and the fruit. If true, then we should expect that other factors that affect the carbohydrate supply or demand would interact with the pest injury. The most obvious interacting factor is the crop load. Heavy crops should make the trees more sensitive to pest stress.

In mature Delicious/M26 trees with different crop loads, ERM injury reduced both leaf and whole tree photosynthesis, but yield differences were not always related to ERM injury. The primary effect of the mites was to decrease late season fruit growth and final fruit size. The effect of high mite injury on fruit size was more severe in normally-cropped trees (see figure). The fruit size distributions showed that for normally-cropped trees, the mite injury dropped the percentage of fruit over 170 grams from about 50% to only 10%. This represented a double penalty in fruit size, since the fruit was already smaller on heavy-cropping trees even before the mites developed. Also, the next season's crop was reduced as well, giving a triple whammy.

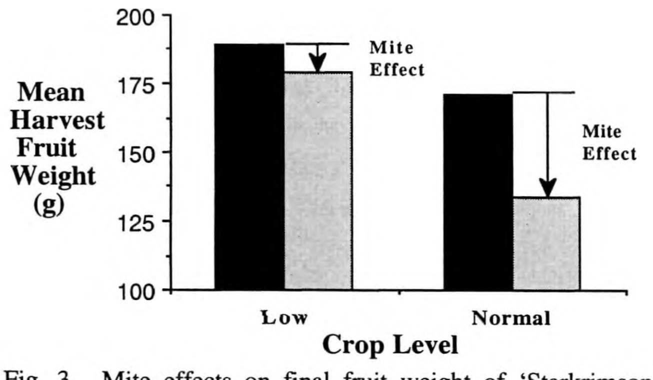

Fig. 3. Mite effects on final fruit weight of 'Starkrimson Delicious' depending on the crop load of the tree. Bar on left of *each pair is for healthy trees* compared to high mite (>1500 mite-days) on right. Note much greater effects on normally-cropped (a good commercial crop) trees that already had smaller fruit size.

Effects on fruit quality were found to be primarily due to reduced size and later maturity that occurred due to higher crop levels or higher mites. All these mite effects on fruit quality and maturity are essentially the same as those expected from heavier crop loads.

Check your foliage; if you miss the chance to control these pests now, there may be no recovering before some significant damage is done to this very susceptible stage of the trees and fruit.❖❖

DISEASES

ALL CHOKED UP

PEACH DISEASE UPDATE
(Dave Rosenberger, Plant Pathology, Highland)

X-disease in Peaches

❖❖ X-disease of peach trees was severe in some Hudson Valley peach orchards last year, so it is no surprise that some trees are again developing X-disease symptoms. Peach X-disease often follows a 10–15 -year cycle. The disease will be very severe for 4–6 years, then will gradually disappear as a commercial problem until the next cycle begins. The reason for this cyclical pattern has never been determined. Some X-disease was noted in the Hudson Valley in 1997 and significant outbreaks occurred in 1998. We can expect the incidence of X-disease to continue increasing for several more years before it begins to subside again.

X-disease causes leaves on infected peach trees to turn yellow, curl upward, and develop red, water-soaked spots that are not limited by leaf veins. The leaf disorder results in early defoliation of the oldest leaves, leaving a "horsetail" of young foliage at the end of affected terminal shoots. X-disease eventually causes

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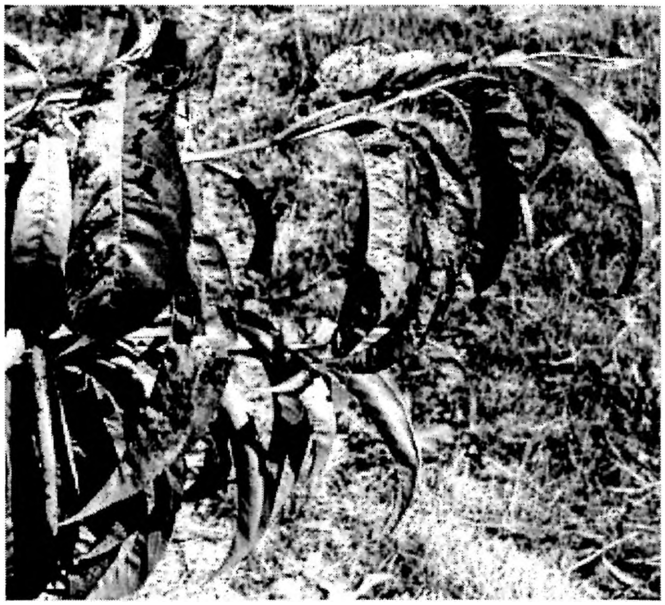
death of the infected scaffold limbs or of the entire tree. Nitrogen deficiency and spray injury can also cause red spotting on leaves, but the symptoms on trees affected by nitrogen deficiency or spray injury usually occur uniformly throughout individual trees and sometimes throughout entire orchards. Symptoms of X-disease affect only random trees and/or branches of trees, although the incidence of X-disease may be higher in locations close to inoculum sources than in more distant parts of the orchard.



X-disease is caused by a phloem-limited mycoplasma — a minute pathogenic organism smaller than most bacteria. The X-disease mycoplasma is transmitted by at least eight species of leafhoppers found in New York. White-apple leafhopper, rose leafhopper, and potato leafhoppers are not vectors. In fact, none of the X-disease vectors are abundant enough to cause direct feeding damage and they usually escape notice in the orchard. However, they are very efficient vectors of X-disease. The leafhoppers acquire the X-disease organism while feeding on diseased chokecherry bushes, on infected sweet cherry trees, or on wild seedlings of sweet cherry. They do not acquire the X-disease mycoplasma from diseased peaches because the population of the disease organism within diseased peach trees is so low that leafhoppers do not encounter the organisms while feeding.

After leafhopper vectors feed on an infected plant, the X-disease organism must grow within the insect for at least 20 days before the insect can transmit X-disease to another plant. Once that 25-day incubation period is completed, however, the leafhoppers with X-disease remain infective for the rest of their lives. In laboratory studies, leafhoppers have often lived for 30–40 days after they become infective. A single infective insect therefore has the potential to infect numerous plants.

Peach trees that become infected with X-disease are usually inoculated by leafhoppers during July and August, and symptoms then develop on the trees the following year. Leafhoppers can continue to transmit X-disease to peach trees during September and early October, but many of the late-season transmissions fail to cause disease because the pathogen does not become established in the plant following late-season transmissions. Relatively mild winters during the last two years may have allowed more of the late-season transmissions to persist through winter and may therefore have contributed to the increasing severity of X-disease.

The most effective protection against X-disease is to isolate peach plantings from all sweet cherry blocks and to regularly eradicate all chokecherries within 500 ft of peach orchards. The chokecherry species that harbors X-disease is *Prunus virginiana*, a plant that is more like a shrub than like a tree. *P. virginiana* rarely reaches more than 15 ft in height in eastern New York. It should not be confused with the wild black cherry (*Prunus serotina*), which can develop into an 80-ft tall tree. *Prunus serotina* does not develop or harbor X-disease.

The two wild cherry species can be distinguished by the appearance of the bark, leaves, and fruit. Leaves of *P. virginiana* are more broadly oval with a hairy mid-rib on the underside of the leaf whereas leaves of *P. serotina* are more narrow and have a smooth mid-rib on the underside of the leaf. Chokecherry plants infected with X-disease de-

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velop a red-yellow fall coloration during early July. With our early season this year, the distinctive color of infected chokecherries began appearing about two weeks ago along roadways in the Hudson Valley.

X-disease symptoms in sweet cherry trees are often indistinct, making it difficult to determine when a sweet cherry tree is infected. Infected trees usually produce small fruit that ripens later than healthy fruit, but this symptom is often indistinct in cherry orchards where fruit maturity is already variable because of uneven crop load . Unlike peach trees, cherry trees with X-disease can remain alive for many years after they become infected. Such infected trees become a long-term source of inoculum for other cherry trees and for peach trees. Whenever possible, peach plantings in the Hudson Valley should be kept at least 500 feet away from sweet cherry plantings.

There is no chemical means (sprays) for protecting trees from X-disease. Leafhopper control in peach orchards may reduce the spread of disease. Early maturing varieties of peaches may benefit from a postharvest insecticide spray to minimize leafhopper populations in these trees during August. However, spraying for leafhoppers is not a substitute for identifying and eradicating inoculum sources because infective leafhoppers can enter the orchard from hedgerows and may infect trees before they are killed by insecticide residues.

Injections of terramycin can be used to treat diseased trees, but the treatment procedure is labor intensive, must be done during September, and must be repeated annually to prevent a relapse of treated trees. Most growers consider it more cost-effective to remove X-diseased trees and replant new trees in their place.

It is not necessary to remove X-diseased peach trees to prevent spread of the disease because peach trees do not act as a source of inoculum for the leafhopper vectors. In young orchards, infected trees can be removed and replanted after the source of inoculum (hedgerow chokecherries or seedling sweet cherries) has been identified and removed. X-disease does not remain active in the soil.

Peach mildews

Mildew infection on peach leaves is not very common, but several species of mildew can cause surface lesions on peach and nectarine fruit. Infections on fruit often appear as discolored spots or rings on immature fruit and as scabby areas on the surface of mature fruit. White spots or rings on immature fruit can be caused by the *Sphaerotheca pannosa*, the common mildew species found on peaches, nectarines, apricots, and roses. Rusty brown spots or rings are symptoms of the disease know as "rusty spot" and are usually caused by *Podosphaera leudotricha*, the apple mildew fungus.

Peaches vary significantly in their susceptibility to both species of mildew. Roses can supply inoculum of *S. panosa* if mildew-susceptible peach varieties are located close to infected roses. Rusty spot can be a significant problem if susceptible peach varieties are planted adjacent to mildew-susceptible apples that will supply inoculum for infecting the peaches.

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Peaches and nectarines are most susceptible to mildew infection between the shuck split and pit hardening stages. Sulfur sprays applied during that interval usually provide adequate protection. Under New York conditions, there is little benefit to applying mildewcides after pit hardening. The symptoms evident on fruit at the pit-hardening stage cannot be eradicated, and continued spread of the disease after pit-hardening is unlikely.❖❖

PEST FOCUS

Geneva:
Spotted tentiform leafminer 2nd flight began 6/10. DD(base 43°F) accumulated since then = 230. 1st catch of **obliquebanded leafroller** = 6/2. DD(base 43°F) accumulated since then = 437.

Highland:
Spotted tentiform leafminer 2nd flight began 6/7. DD(base 43°F) accumulated since then = 360. 1st **obliquebanded leafroller** catch was on 6/2. DD(base 43°F) accumulated since then = 489. (Expect first hatch @ 360) **Apple blotch leafminer** and **apple leaminer** damage observed on apple terminal growth. 1st **rose leafhopper** nymphs observed on apple. **Potato leafhopper** nymphs increasing. The 2nd flight of **redbanded leafroller** is beginning. Degree days (base 50°F) accumulated since 1st **codling moth** trap catch = 719. Control of the 2nd generation is timed at 1260 DD_{50} from 1st catch.

UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations (Geneva 1/1–6/21):	1212	750
(Geneva 1998 1/1–6/21):	1349	837
(Geneva "Normal" 1/1–6/21):	1093	745
Hudson (3/17–6/21):	1275	780
(Highland 1/1–6/21):	1442	903

Coming Events:	Ranges:	
Obliquebanded leafroller summer larvae hatch	1076–1513	630–980
American plum borer 1st flight subsides	848–1668	440–1205
Apple maggot 1st catch	1045–1671	629–1078
Comstock mealybug 1st adult catch	1270–1673	756–1105
Spotted tentiform leafminer 2nd flight peaks	1295–2005	824–1355
American plum borer 2nd flight begins	906–1876	973–1337
Codling moth 1st flight subsides	1112–2124	673–1412
Lesser appleworm 2nd flight begins	1152–2302	778–1531
Lesser peachtree borer flight peak	733–2330	392–1526
Oriental fruit moth 2nd flight begins	1152–1819	772–1215
Peachtree borer flight peak	864–2241	506–1494
Redbanded leafroller 2nd flight begins	1096–2029	656–1381

NOTE: Every effort has been made to provide correct, complete and up-to-date pesticide recommendations. *Nevertheless,* changes in pesticide regulations occur constantly, and human errors are possible. These recommendations are not a substitute for pesticide labelling. Please read the label before applying any pesticide.

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